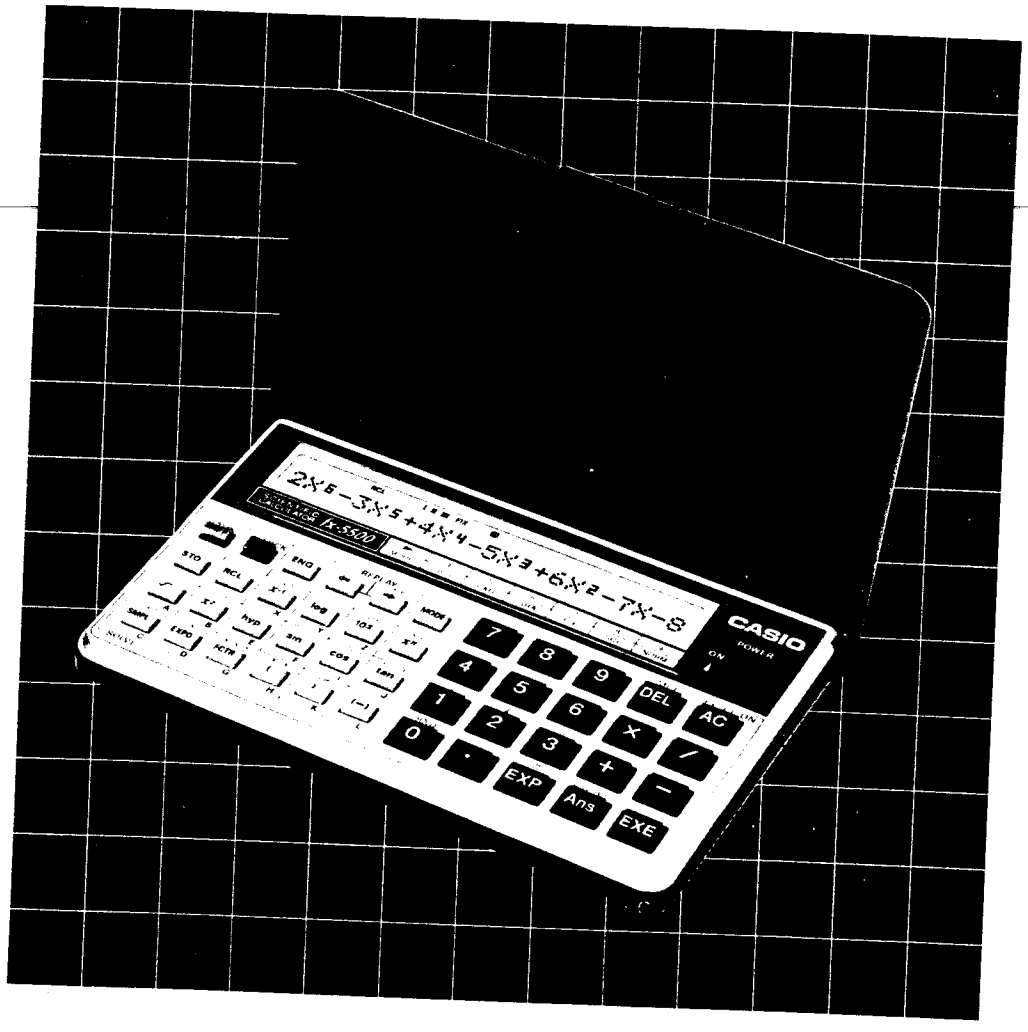
fx-5500

OWNER'S MANUAL



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CASIO

INTRODUCTION

Thank you for your purchase of the CASIO fx-5500. With this unit, formulas are displayed as they are input on a large, easy-to-read 24 digit liquid crystal display. A total of 34 functions team up with expansion and factoring, to make this unit one of the most advanced calculators in its class.
Manual calculations can also be easily performed by inputting the expression just as it is written. A handy replay function makes it possible to confirm operations and make corrections with the touch of a key.
Be sure to carefully read this manual thoroughly and carefully follow the procedures outlined herein to ensure correct operation and to get the most out of the features of this unit.

- Note that the manufacturer assumes no responsibility for any injury or loss incurred while using this manual.

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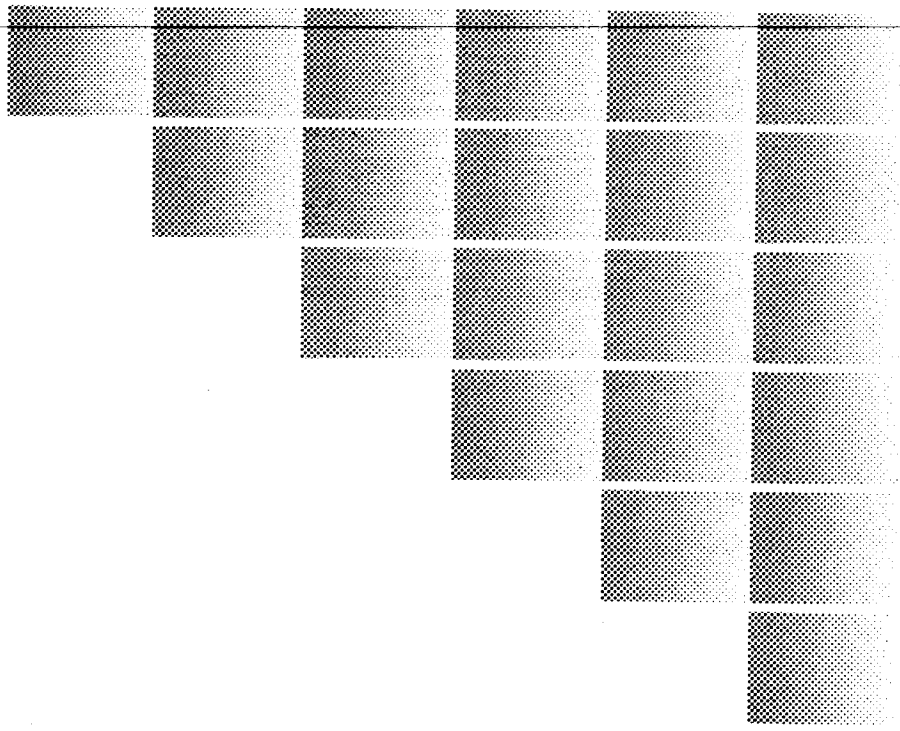
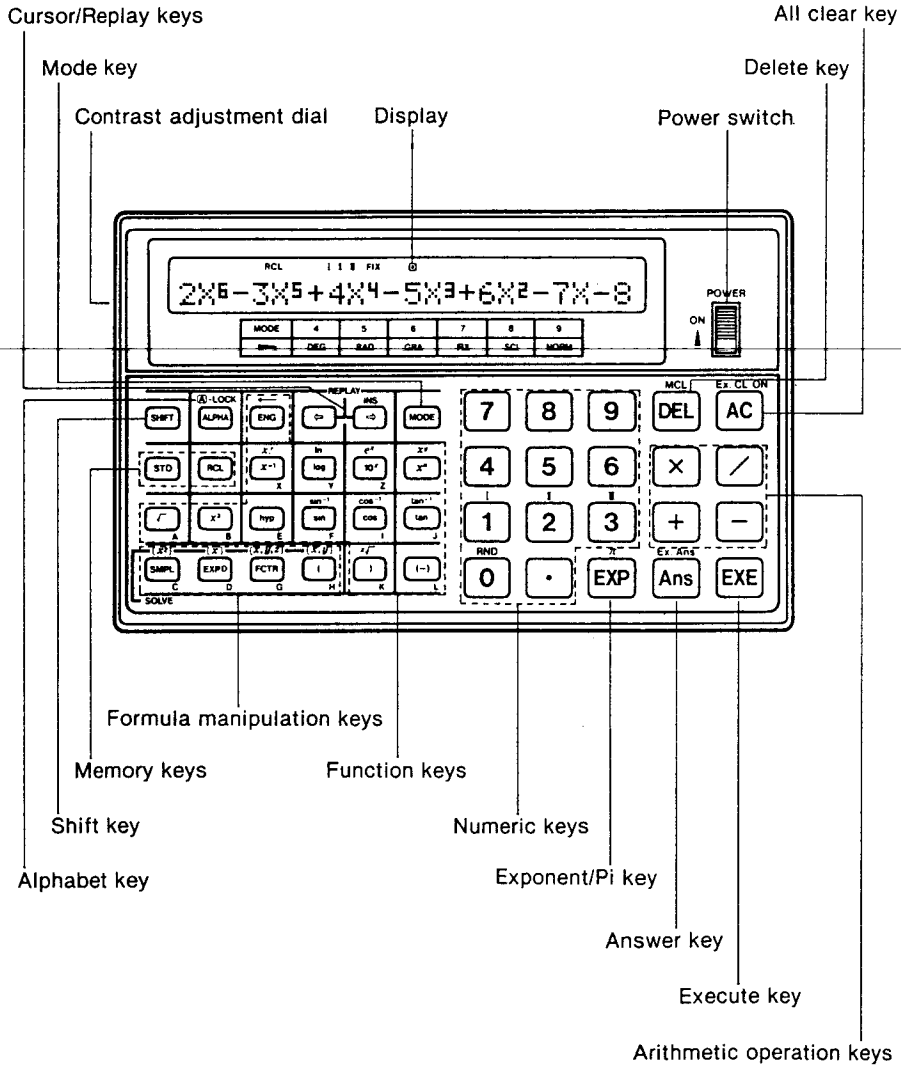
■ Handling precautions

- This unit is composed of precision electronic components, and should never be disassembled.
  Do not drop the unit or otherwise subject it to sudden impacts or sudden temperature changes. Be especially careful to avoid storing the unit or leaving it an areas exposed to high temperature, humidity, or large amounts of dust.
  When exposed to low temperatures, the unit will require more time to display answers and may even fail to operate. The display should return to normal once normal temperature is attained.
- Batteries should be replaced every 2 years, even if the unit is not used for extended periods. Never leave dead batteries in the battery compartment. They may leak and cause damage to the unit.
- Avoid using volatile liquids such as thinner or benzine to clean the unit. Wipe the unit with a soft, dry cloth or a cloth that has been dipped in a weak neutral detergent solution and wrung out.
- If malfunction of the unit should occur, either bring or send the unit to your retailer or nearest CASIO dealer. Be sure to clearly explain the problem in detail.
- Before assuming malfunction of the unit, be sure to carefully reread this manual and ensure that the problem is not due to insufficient battery power, or operational errors.

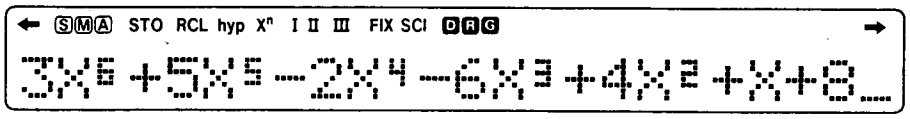
CONFIGURATION AND OPERATION 1



1-1 NOMENCLATURE AND FUNCTIONS



■ Display



A "status display" is located at the top of the display to provide information on the status of the unit.
The status display illuminates for each of the operational modes of the unit.

← Displayed formula or value exceeds the limit of the display to the left.
S [SHIFT] key pressed.
M [MODE] key pressed.
A [ALPHA] key pressed.
STO [STO] key pressed.
RCL [RCL] key pressed.
hyp [hyp] key pressed.
X^n [x^{-1}] key pressed.
I Formula stored in formula memory I.
II Formula stored in formula memory II.
III Formula stored in formula memory III.
FIX Number of decimal places specified.
SCI Number of significant digits specified.
D Angular unit = degrees.
R Angular unit = radians.
G Angular unit = grads.
→ Displayed formula or value exceeds the limit of the display to the right.

Formulas and/or calculation results are shown at the bottom of the display. Zeros are indicated as 0̸, and the power values for such displays as "x^6" appear as they are written. The " _ " appearing at the 24th digit in the example above is the cursor, and it indicates the next input position.

■ Power switch

Power is turned ON by sliding the power switch up. Sliding the power switch down turns power OFF.

■ Special operation keys

[SHIFT] Shift key

Press to use the function commands and functions marked in brown on the key panel. The symbol S will illuminate on the display to indicate that [SHIFT] was pressed. Pressing [SHIFT] again will cause the S to disappear from the display and the unit to return to the status it was in before [SHIFT] was originally pressed.

[MODE] Mode key

Press in combination with another key to set the status of the unit or the angular unit.

[MODE] [4]...D illuminates on the display to indicate the angular unit is specified as degrees.

[MODE] [5]...R illuminates on the display to indicate the angular unit is specified as radians.

[MODE] [6]...G illuminates on the display to indicate the angular unit is specified as grads.

[MODE] [7] ...FIX illuminates on the display to indicate the number of decimal places is set at a value from 0 through 9. i.e. [MODE] [7] [3] → 3 decimal places

[MODE] [8] ...SCI illuminates on the display to indicate the number of significant digits is set at a value from 0 through 10. i.e. [MODE] [8] [5] → 5 significant digits

[MODE] [9] ...Cancels any previous number of decimal place or number of significant digit settings.

[ALPHA] Alphabet key

Press in combination with another key to input alphabetic characters or special symbols. Pressing [ALPHA] displays A and allows the input of only one character. After that, the unit returns to the status it was in before [ALPHA] was originally pressed.

Pressing [SHIFT] followed by [ALPHA] will lock the unit in the alphabet mode and allow consecutive input of alphabetic characters until [ALPHA] is pressed again.

		X	Y	Z	
A	B	E	F	I	J
C	D	G	H	K	L

* Letters A through L can be used as value memories.

REPLAY INS

⇦ ⇨ Cursor/Replay keys

Press ⇦ to move the cursor to the left and ⇨ to move the cursor to the right on the display to correct formulas or numeric values. Holding down either key will cause continuous movement of the cursor in the direction marked on the key.

These keys become Replay keys once a formula or numeric values is input and [EXE] is pressed. Pressing ⇦ displays the formula or numeric value from the end, while pressing ⇨ displays it from the beginning. At this time, the formula or numeric value can be reexecuted or reentered as it is or after modification (see page 32). Pressing [SHIFT] followed by [INS] (⇨) will make it possible to insert a numeric value or a command into the existing line.

Md DEL Delete key
Press to delete the character at the current cursor position. When the character is deleted, everything to the right of the cursor position will shift one space to the left. Pressing SHIFT Md will clear value memory contents.

Ex.Cl AC All clear key
Press to completely clear the formula or numeric value displayed. Also used to clear errors indicated by error message displays.
Pressing SHIFT Ex.Cl AC will clear formula memory contents. Also restores power after activation of the auto power OFF function (see page 14).

EXE Execute key
Press to obtain the result of a calculation.

Ex.Ans Ans Answer key
Press followed by EXE to recall the calculation result produced by the last press of the EXE key. The value stored by this function can be directly incorporated into subsequent calculations.
i.e.
2 × 2 EXE 4
2 × Ans EXE 8
Pressing SHIFT Ex.Ans Ans will display the result of latest execution of a formula manipulation (see page 38).

■ 0 1 — 9 · Numeric/Decimal point keys
Press the numeric keys in the order that the numeric value is written from left to right, entering the decimal point where required.
The 1, 2, and 3 keys are used in combination with STO and RCL to store and recall formulas using the formula memory. Pressing one of these three keys following SHIFT, causes the corresponding Roman numeral (I, II, III) to appear on the display to represent the formula contained in that memory. For example, if A + B is stored in memory I, the formula A + B + C can be entered as: I + C (see page 22).
Pressing the RND 0 key following SHIFT causes all internal numeric value to be rounded off to make it equal to the displayed value (see page 31).

π EXP Exponent/Pi key
Press to input the exponent after input of the mantissa. For example, the following operation should be performed to input 2.56×10^{-34}: 2.56 EXP (−) 34

Pressing this key after SHIFT inputs the value for π.

■ + − × ÷ Arithmetic operation keys

Press the appropriate key to input the operator for the desired arithmetic operation as it occurs in a calculation. The ÷ key represents the division operation.

■ Function keys

The EXE key must be pressed to obtain the result for function key operations except for function keys which perform operations on calculation results (i.e. ENG).

ENG Engineering key

- Press to convert a calculation result to an exponential display whose exponent is a multiple of three (10^3=k, 10^6=M, 10^9=G, 10^{-3}=m, $10^{-6}=\mu$, 10^{-9}=n, 10^{-12}=p).

x^{-1} Reciprocal/Factorial key

- Press after entering a value to obtain the reciprocal for that value.
- Press following SHIFT after entering a value to obtain the factorial for that value.

ln log Common logarithm/Natural logarithm key

- Press prior to entering a value to obtain the common (base 10) logarithm for that value.
- Press following SHIFT prior to entering a value to obtain the natural (base e) logarithm for that value.

e^x 10^x Exponent key

- Press prior to entering a value to obtain 10 to the power of that value.
- Press following SHIFT prior to entering a value to obtain e to the power of that value.

x^y $\sqrt[x]{}$ Power key

- Press after entering x (any value) and prior to entering n (natural number) or y (any value) to obtain the value that corresponds to x^n or x^y.
- Press after entering a value (x), and the symbol X^n will appear on the display to specify power input. The X^n symbol will disappear from the display when a single numeric value key is pressed, or if x^y is pressed again. To enter a multiple digit power value, press x^y before entry of each digit. The power (n) will appear on the display as a superscript.
- Press following SHIFT after entering a value (x), and the symbol "^" will appear on the display. The following input will be applied as the power (y) of x.

√ Root key
- Press prior to entering a value to obtain the square root for that value.

x^2 Square key
- Press after entering a value to obtain the square for that value.

hyp Hyperbolic key
- Press hyp followed by one of the trigonometric function keys (sin, cos, tan) prior to entering a value to obtain the respective hyperbolic function for that value. The symbol hyp will appear on the display when this key is pressed, and this symbol can be canceled by pressing hyp again before pressing a trigonometric function key.
- Press SHIFT followed by hyp and then one of the trigonometric function keys prior to entering a value to obtain the respective inverse hyperbolic function for that value. Inverse hyperbolic functions can also be obtained by pressing hyp followed by SHIFT and then one of the trigonometric function keys prior to entering a value.

sin cos tan Trigonometric/inverse trigonometric function keys
- Press prior to entering a value to obtain the respective trigonometric function (sin, cos, tan) for that value.
- Press following SHIFT prior to entering a value to obtain the respective inverse trigonometric function ($\sin^{-1}$, $\cos^{-1}$, $\tan^{-1}$) for that value.

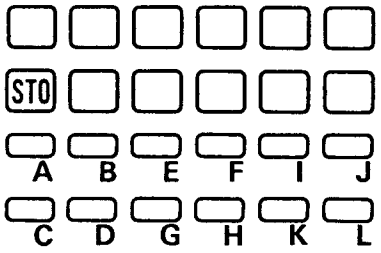
( ) Parenthesis keys
- Press either as required to input parentheses at appropriate locations in formulas.
- Press $\sqrt[x]{\ }$ following SHIFT after entering a value for x and prior to entering a value for y to obtain the xth root of y.
- Press to when solving simultaneous linear equations containing two unknowns (see page 45).

(−) Minus key
- Press prior to entering a value to make that value negative.

■ Memory keys

STO Memory store key

- Press followed by a value memory key (A through L) to store the displayed numeric value or calculation result in a value memory. A total of 12 value memories are available, and values are stored in the memory that corresponds to the memory key pressed.



- Press followed by a formula memory key (△, △, △) to store the displayed formula (or numeric value) in a formula memory.

RCL Memory recall key

- Press followed by a value memory key (A through L) to recall the numeric value stored in that memory.
- Press followed by a formula memory key (△, △, △) to recall the formula (or numeric value) stored in that memory.

■ Formula manipulation keys

(x') SMPL C Simplify key

- Press to simplify the displayed formula.
  (i.e. $2x + x + 4x \times x \rightarrow 4x^2 + 3x$)
- Press following SHIFT when solving quadratic equations containing a single unknown quantity.

(x) EXPD D Expand key

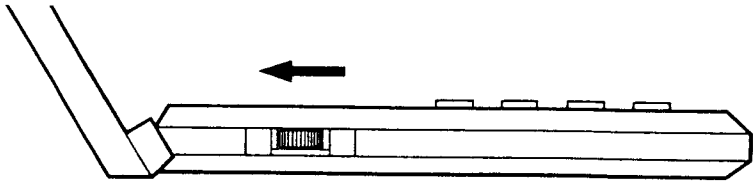
- Press to expand the displayed formula.
  (i.e. $(x-1)^2 \rightarrow x^2 - 2x + 1$)
- Press following SHIFT when solving linear equations containing a single unknown quantity.

(x,y,z) FCTR G Factor key

- Press to factor the displayed formula.
  (i.e. $a^2 + 2a + 1 \rightarrow (a + 1)^2$)
- Press following SHIFT when solving linear equations with three unknown quantities.

■ Contrast adjustment dial

The display may sometimes appear too dark or too light depending upon remaining battery power or viewing angle. In such cases, the contrast of the display can be adjusted using the dial located on the right edge of the unit.



Rotating the dial in the direction indicated by the arrow will cause the characters on the display to become stronger, while rotating it in the opposite direction will cause them to become weaker. A weak display even when contrast is set at its maximum may indicate that battery power is too low. In this case, batteries should be replaced as soon as possible.

■ Auto power OFF function

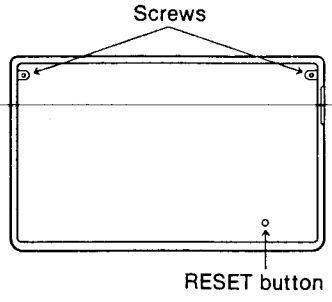
The power of the unit is automatically switched OFF approximately 6 minutes after the last key operation. Once this occurs, power can be restored either by switching the power of the unit OFF and then ON again, or by pressing the AC key. Memory contents and calculation modes are unaffected when power is switched OFF.

1-2 BATTERY REPLACEMENT

Power is supplied to this unit by two lithium batteries (CR2032). Weakened batteries will make the display weak and difficult to read. Both batteries should be replaced as soon as possible when the display remains weak even at the maximum contrast setting (see page 14).

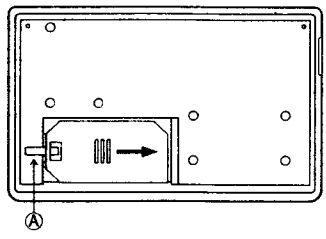
* Batteries more than two years old may leak and damage the unit. Be sure to replace batteries every two years even if the unit is not used during that period.
* Anything stored in numeric value or formula memories is erased when batteries are replaced.

■ Procedure



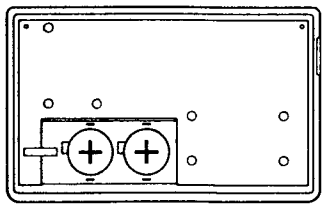
① Slide the power switch to the OFF positions, use a screwdriver to loosen the two screws on the back of the unit, and remove the back cover.

② Remove the battery holder by sliding in the direction indicated by the arrow while pressing down at point Ⓐ.



③ Remove both of the old batteries from the unit.

④ Wipe the surfaces of two new batteries with a soft, dry cloth and load them into the unit with the positive ⊕ sides facing up.



⑤ Slide the battery holder back into place while pushing down firmly.

⑥ Replace the back cover of the unit using the two screws, turn the unit ON, and press the RESET button on the back of the unit using a thin pointed object.

IMPORTANT: Batteries may EXPLODE if exposed to fire. Never dispose of batteries in such a way that they will be incinerated.

* **Keep batteries out of reach of small children. If a battery should inadvertently be swallowed, contact a doctor immediately.**

1.3 GENERAL OPERATION

■ Calculation priority sequence

This unit employs true algebraic logic to automatically compute the parts of a formula in the following order:

1. Type A functions* x^2, x^{-1}, $x!$
2. Powers/roots $x^n(x^y)$, $\sqrt[x]{\ }$
3. Abbreviated multiplication formats in front of π, memory or parenthesis 2π, 4R, 3(5+6), etc.
4. Type B functions* $\sqrt{\ }$, log, 10^x, ln, e^x, sin, cos, tan, $\sin^{-1}$, $\cos^{-1}$, $\tan^{-1}$, sinh, cosh, tanh, $\sinh^{-1}$, $\cosh^{-1}$, $\tanh^{-1}$, (−)
5. Abbreviated multiplication formats in front of Type B functions
   3 sin5, $6\sqrt{7}$, 2sin30cos60, etc.
6. ×, ÷
7. +, −

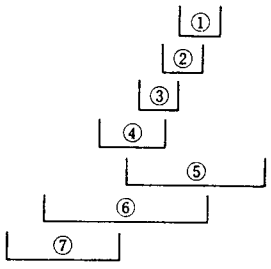
* Functions are divided into two different types:
Type A functions which precede the argument
Type B functions which follow the argument

* Functions in series with the same priority are executed from right to left:
e.g., $e^x \ln\sqrt{120} \rightarrow e^x\{\ln(\sqrt{120})\}$.
Otherwise, execution is performed from left to right.

* Compound functions are executed from right to left.
e.g., $\sin\cos^{-1}0.6 \rightarrow \sin(\cos^{-1}0.6)$.

* Anything contained within parentheses receives highest priority.

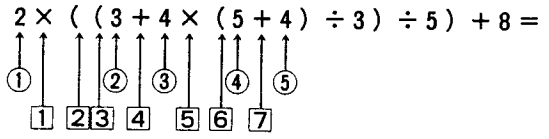
Ex. $2+3\times(\log \sin 2\pi\ ^2_{\text{rad}}+6.8)=22.07101691$



■ Stacks

This unit contains a pair of memories known as "stacks" for temporary storage of low priority numeric values and calculation commands (such as functions). The numeric value stack has eight levels, while the command stack has 20 levels. An attempt to execute a complex formula that exceeds the amount of available stack space will result in a stack error (Stk ERROR appears on the display).

Ex. Counting the number of stack levels required



Numeric value stack

①	2
②	3
③	4
④	5
⑤	4
⋮	

Command stack

1	×
2	(
3	(
4	+
5	×
6	(
7	+
⋮	

* Calculations are performed in the order of the highest priority first. Once a calculation is executed, it is cleared from the stack.
* A 15-level numeric value stack and 20-level command stack is also available for formula manipulation.

■ Input, output and calculation value limitations

The input/output range (maximum number of digits) of this unit is 10 digits for the mantissa and 2 digits for the exponent. The maximum size that values can attain during internal calculations, however, is 12 digits for the mantissa and 2 digits for the exponent.

Ex. $3\times10^5\div7=$

3 EXP 5 ÷ 7 EXE

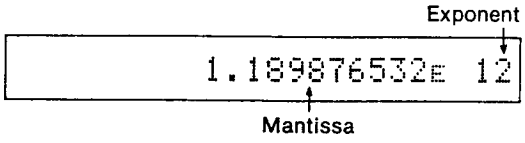
3 EXP 5 ÷ 7 − 42857 EXE

42857.14286
0.1428571

* Calculation results 10^{10} (10 billion) or greater or less than 10^{-1}(0.1) are automatically displayed in exponential form.

Ex. $123456789\times9638=$

123456789 × 9638 EXE



Once a calculation is complete, the mantissa is rounded off to 10 digits and displayed. The displayed value can be used in the next calculation.

Ex. $3\times10^5\div7=$

3 EXP 5 ÷ 7 EXE

− 42857 EXE

42857.14286
0.14286

■ Overflow and errors

Exceeding the calculation range of the unit or performing incorrect input will result in and error message display and subsequent operation will be impossible. Errors will be generated in the following cases:

(1) When an intermediate result, final result, or any value in memory exceeds $\pm 9.999999999 \times 10^{99}$.

(2) When an attempt is made to perform calculations outside of the specified input range of function calculations (see page 50).

(3) When the capacity of the numeric value or command stack is exceeded during calculations. (i.e. Entering 19 consecutive parentheses followed by 2 + 3 × 4)

(4) When EXE is pressed after erroneous input. (i.e. 5 + + 3 EXE)

The following error messages will be displayed for the operations noted above:
(1),(2) Ma ERROR
(3) Stk ERROR
(4) Syn ERROR
In addition to these, the following three error messages can be generated during formula manipulations:
Ind ERROR (Indeterminate error)
Inc ERROR (Inconsistent error)
Uns ERROR (Unsolvable error)
Details concerning these error messages can be found in Chapter 3 FORMULA MANIPULATION.

■ Input limitation

This unit features a 79-step area for storage of numeric value and command input for each calculation. Each function, as well as each press of [+], [−], [×] or [÷] all comprise one step. Though such functions as [SHIFT] [x²] require two key operations, they are counted as a single step.
The number of steps used can be confirmed using the cursor. Each press of the [◁] or [▷] key moves the cursor from one step to the next on the display. Input for a single calculation is limited to 79 steps, and the cursor "_" will change to a blinking "▮" at the 73rd step to signal that the limit is being reached. Calculations exceeding 79 steps should be divided at some point and performed in two stages.

* Numeric value and calculation commands appear on the display from the left as they are input, while calculation results are displayed from the right.

■ Corrections

- Corrections can be made in a formula during input by moving the cursor to the location of the correction using the [◁] and [▷] keys and pressing the correct keys.

Ex. To change an input of 122 to 123:

[1][2][2]	122_
[◁]	122
[3]	123_

Ex. To change an input of cos60 to sin60:

Keys	Display
cos 6 0	cos 60_
⇦ ⇦ ⇦	cos 60
sin	sin 60

* The result of a formula can be obtained by pressing = immediately after making corrections, regardless of the cursor location. The ⇨ cursor key can also be used to move back to the end of the formula for additional input.

- Unnecessary portions of a formula can be deleted during input by moving the cursor to the location of the deletion using the ⇦ and ⇨ keys and pressing the DEL key. Each press of DEL will delete one step.

Ex. To change an input of 369 × × 2 to 369 × 2:

Keys	Display
3 6 9 × × 2	369××2_
⇦ ⇦ DEL	369×2

- Omitted portions of a formula can be inserted during input by moving the cursor to the location of the input using the ⇦ and ⇨ keys and pressing SHIFT followed by the INS key. Then the proper command or character can be input.

Ex. To change an input of 2.36^2 to $\sin 2.36^2$:

Keys	Display
2 . 3 6 x^2	2.36^2_
⇦ ⇦ ⇦ ⇦ ⇦	2.36^2
SHIFT INS	$[2.36^2$
sin	sin $[2.36^2$

* The space that is created for insertion will be displayed as "[]". This symbol will remain on the display until ⇦, ⇨ or AC is pressed.

■ Memory

This unit is equipped with 12 value memories and three formula memories. Storage to and recall from both types of memory is accomplished using the STO and RCL keys.

• Value memories

The 12 value memories are named using the letters A through L. Values with a 12-digit mantissa and 2-digit exponent can be stored, and when recalled they appear with a 10-digit mantissa and 2-digit exponent.

Ex. To store the value 123.45 in memory A:

123.45 STO A

```
                123.45
```

Ex. To store the result of 78.9 × 45.36 in memory B:

78.9 × 45.36

STO B

```
78.9×45.36_
          3578.904
```

Ex. To add the value in memory A to that in memory B:

RCL A + RCL B

EXE

```
123.45+3578.904_
          3702.354
```

* The value stored in a memory can be used in a formula by simply designating the memory name.

ALPHA A + ALPHA B

EXE

```
A+B_
          3702.354
```

Value memories can be cleared either individually or all at once.

① To clear an individual value memory, 0 is first displayed and then assigned to the memory to be cleared.

AC 0 STO A

RCL A

```
                0.
                0.
```

② To clear all value memories (A through L), press SHIFT and then MCL.

SHIFT MCL

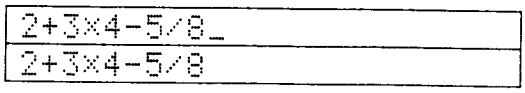
RCL B

```
_
0._
```

- **Formula memories**
  The three formula memories are named using the Roman numeral I, II, and III. Formulas up to 79 steps long or numeric values (10-digit mantissa and 2-digit exponent) can be stored.

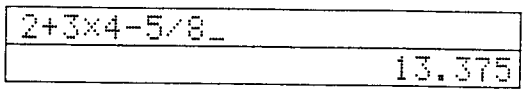
Ex. To store the formula 2 + 3 × 4 - 5 / 8 in formula memory I:

2 + 3 × 4 − 5 / 8
STO ▷



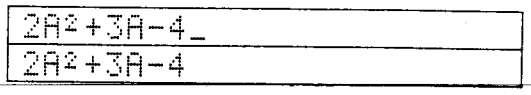
Ex. To recall and execute the formula stored in formula memory I:

AC RCL ▷
EXE



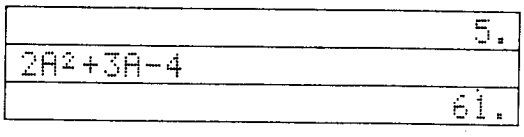
Ex. To store the formula $2a^2 + 3a - 4$ in formula memory II:

2 ALPHA (A) x^2 + 3 ALPHA (A) − 4
STO ▷



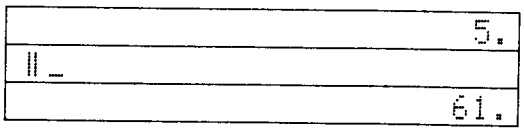
Ex. To obtain the result for the formula stored in formula memory II when the value stored in value memory A is 5:

5 STO (A)
RCL ▷
EXE



Formulas can be calculated by simply designating the memory name.

5 STO (A)
SHIFT ▷
EXE



* Formulas that exceed the 79-step limit are automatically truncated when recalling a formula memory.

Formula memories can be cleared either individually or all at once.

① To clear an individual formula memory, 0 is first displayed and then assigned to the memory to be cleared.

[AC] [0] [STO] [A]
[RCL] [A]

② To clear all formula memories (I, II, III), press [SHIFT] and then [Ex.CL].

[SHIFT] [Ex.CL]
[RCL] [A]

* Clearing all of the formula memories does not effect formulas currently being used in calculations.

■ Answer function

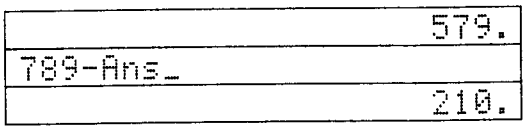
The answer functions of this unit make it possible to recall the results of the most recent operations. A value answer function stores the result of the most recent calculation. A formula answer function stores the result of a formula manipulation using the [SMPL], [EXPD], and [FCTR] keys.

● Value answer function

This function stores the most recent result of any operation finalized using the [EXE] key. The stored value is recalled by pressing the [Ans] key. The display will show "Ans" when [Ans] is pressed, which represents the value stored in the numeric value answer function memory. "Ans" can be directly incorporated into a calculation.

* Hereinafter, Ans will be referred to as the Ans memory in order to facilitate understanding.

Ex. 123+456=579
789−579=210
[1] [2] [3] [+] [4] [5] [6] [EXE]
[7] [8] [9] [−] [Ans]
[EXE]



Values with a 10-digit mantissa and 2-digit exponent can be stored in the Ans memory, and they are retained even when the power of the unit is switched OFF or the AC is pressed. Values stored in the Ans memory is updated each time an operation is finalized using EXE.
Operations to store numeric values to other memories using EXE do not effect the status of the Ans memory.
The Ans memory can be used in the same manner as other memories in calculations. In multiplication operations, the "×" immediately before Ans can be omitted.

Ex. $15 \times 3 = \underline{45}$

$78 \times \underline{45} - 23 = 3487$

15 × 3 EXE

7 8 Ans − 2 3 EXE

```
45.
3487.
```

- **Formula answer function**
  This function stores the most recent formula manipulation result obtained using the SMPL, EXPD, or FCTR key.

Ex. To expand $(2x + 3)(4x + 5)$, and then square the result:

(2 ALPHA x + 3) (4 ALPHA x + 5)

```
(2X+3)(4X+5)_
```

EXPD

```
8X²+22X+15
```

(SHIFT Ex.Ans) x^2

```
(8X²+22X+15)²_
```

EXPD

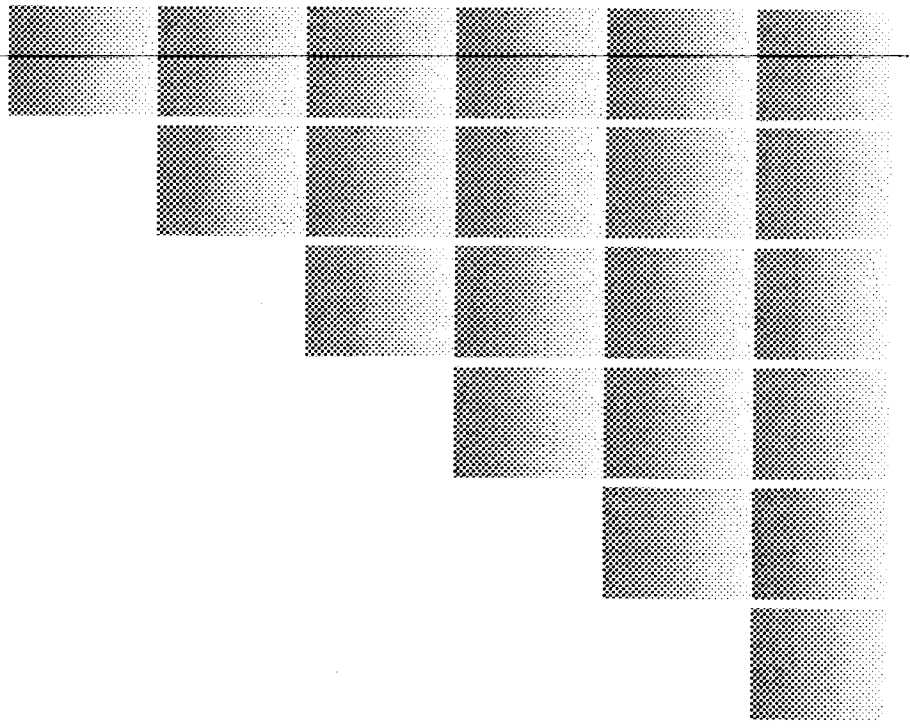
```
64X⁴+352X³+724X²+660X+22
```

⇨

```
4X⁴+352X³+724X²+660X+225
```

* Details concerning formula manipulation begin on page 39.
★ The formula answer memory can hold a formula up to 79 steps long.

MANUAL CALCULATIONS 2



2-1 BASIC CALCULATIONS

■ Arithmetic operations

- Arithmetic operations are input by pressing the keys in the order they appear in the formula from left to right.
- Press [(-)] before entering a value to specify a negative value.

Example	Operation	Display
$23+4.5-53=-25.5$	23 [+] 4.5 [−] 53 [=]	-25.5
$56\times(-12)\div(-2.5)=268.8$	56 [×] [(-)] 12 [÷] [(-)] 2.5 [=]	268.8
$12369\times7532\times74103=6.903680613\times12^{12}$ (6903680613000)	12369 [×] 7532 [×] 74103 [=]	6.903680613 E 12
* Results 10^{10} (10 billion) or greater or less than 10^{-2}(0.01) are displayed in exponential form.		
$(4.5\times10^{75})\times(-2.3\times10^{-79})=-1.035\times10^{-3}$ (-0.001035)	4.5 [EXP] 75 [×] [(-)] 2.3 [EXP] [(-)] 79 [=]	-1.035E-03
$(1\times10^{5})\div7=14285.71429$	1 [EXP] 5 [÷] 7 [=]	14285.71429
$(1\times10^{5})\div7-14285=0.7142857$	1 [EXP] 5 [÷] 7 [−] 14285 [=]	0.7142857
* Internal calculations are performed with a 12-digit mantissa, and results are displayed rounded off to 10 digits.		

- Multiplication and division are given priority over addition and subtraction in mixed arithmetic operations.

Example	Operation	Display
$3+5\times6=33$	3 [+] 5 [×] 6 [EXE]	33.
$7\times8-4\times5=36$	7 [×] 8 [−] 4 [×] 5 [EXE]	36.
$1+2-3\times4\div5+6=6.6$	1 [+] 2 [−] 3 [×] 4 [÷] 5 [+] 6 [EXE]	6.6

■ Parenthesis calculations

Example	Operation	Display
$100-(2+3)\times4=80$	100 [−] [(] 2 [+] 3 [)] [×] 4 [EXE]	80.
$2+3\times(4+5)=29$	2 [+] 3 [×] [(] 4 [+] 5 [EXE]	29.
* Closed parentheses immediately before operation of [EXE] may be omitted.		
$(7-2)\times(8+5)=65$	[(] 7 [−] 2 [)] [(] 8 [+] 5 [EXE]	65.
* Multiplication signs immediately before open parentheses may be omitted.		
$10-\{2+7\times(3+6)\}=-55$	10 [−] [(] 2 [+] 7 [(] 3 [+] 6 [EXE]	−55.
* For the sake of clarity, abbreviated style will not be used in the examples included in this manual.		
$\frac{2\times3+4}{5}=(2\times3+4)\div5=2$	[(] 2 [×] 3 [+] 4 [)] [÷] 5 [EXE]	2.
$\frac{5\times6+6\times8}{15\times4+12\times3}=0.8125$	[(] 5 [×] 6 [+] 6 [×] 8 [)] [÷] [(] 15 [×] 4 [+] 12 [×] 3 [)] [EXE]	0.8125
$(1.2\times10^{19})-\{(2.5\times10^{20})\times\frac{3}{100}\}=4.5\times10^{18}$	1.2 [EXP] 19 [−] [(] 2.5 [EXP] 20 [×] 3 [÷] 100 [)] [EXE]	4.5E 18
$\frac{6}{4\times5}=0.3$	6 [÷] [(] 4 [×] 5 [)] [EXE]	0.3
*1 The above is equivalent to 6 [÷] 4 [÷] 5 [EXE].		

■ Value memory calculations

● Data included in value memories are not cleared by switching the power of the unit OFF. Value memories are cleared by [SHIFT] [AC].

Example	Operation	Display
9.874×7=69.118	9.874 [STO] [A]	9.874
9.874×12=118.488	[RCL] [A] [×] 7 [EXE]	69.118
9.874×26=256.724	[RCL] [A] [×] 12 [EXE]	118.488
9.874×29=286.346	[RCL] [A] [×] 26 [EXE]	256.724
	[RCL] [A] [×] 29 [EXE]	286.346

• The [STO] key is used to enter values into memory. (Values entered into memory replace any other value previously stored.)

23+9=32	23 [+] 9 [STO] [B]	32.
53−6=47	53 [−] 6 [EXE]	47.
−) 45×2=90	[ALPHA] [B] [+] [Ans] [STO] [B]	79.
99÷3=33	45 [×] 2 [EXE]	90.
Total 22	[ALPHA] [B] [−] [Ans] [STO] [B]	−11.
	99 [÷] 3 [EXE]	33.
	[ALPHA] [B] [+] [Ans] [STO] [B]	22.
12×(2.3+3.4)−5=63.4	2.3 [+] 3.4 [STO] [H]	5.7
30×(2.3+3.4+4.5)−15	12 [×] [ALPHA] [H] [−] 5 [EXE]	63.4
×4.5=238.5	4.5 [STO] [G]	4.5
	30 [×] [(] [ALPHA] [H] [+] [ALPHA] [G] [)] [−]	
	15 [×] [ALPHA] [G] [EXE]	238.5

★ The alphabetic character assigned to each key is noted on the keyboard panel below the key and to the right. (i.e. [A])

■ Specifying the number of decimal places, the number of significant digits and the exponent display

- The number of decimal places is specified by pressing MODE followed by 7, and then a value (0—9) to indicate the number of places. The indicator "FIX" will be shown on the display as long as the number of decimal places is specified.
- The number of significant digits is specified by pressing MODE followed by 8, and then a value (0—9) to indicate the number of digits. The indicator "SCI" will be shown on the display as long as the number of significant digits is specified.
- Pressing of MODE 9 releases the above two specifications.
- Pressing the ENG key or SHIFT followed by ENG will cause the exponent for the number being displayed to change in multiples of three.
- The specified number of decimal places and the number of significant digits can be changed at any time by repeating the respective procedures outlined above. Specified values are not canceled when the power of the unit is switched OFF, but they can canceled by pressing MODE followed by 9.
- Internal calculations are performed with 12-digit mantissas, and displayed values are stored in memory (Ans, value, formula) with 10-digit mantissas, even when the number of decimal places or the number of significant digits is specified. Press SHIFT followed by ANS to convert the internal value to the displayed value.

Example	Operation	Display
100÷6=16.66666666···	100 ÷ 6 EXE	16.66666667
	MODE 7 4 (Four decimal places)	16.6667
	MODE 9 (Specification canceled)	16.66666667
	MODE 8 5 (Five significant digits)	1.6667E 01
	MODE 9 (Specification canceled)	16.66666667

* Displayed values are rounded off to the specified place.

Example	Operation	Display
200÷7×14=400	MODE 7 3 (Three decimal places)	16.667
	200 ÷ 7 EXE	28.571
(Calculation continues with 10-digit display)	×	8.57142857×
	14 EXE	400.000
	Same calculation using the specified number of decimal places)	
	200 ÷ 7 EXE	28.571
	(Internal rounding) SHIFT AND	28.571
	×	28.571×
	14 EXE	399.994
	MODE 9 (Specification canceled)	399.994
123m×456=56088m =56.088km	123 × 456 EXE	56088.
	ENG	56.088E 03
78g×0.96=74.88g =0.07488kg	78 × 0.96 EXE	74.88
	SHIFT ENG	0.07488E 03

2-2 SPECIAL FUNCTIONS

■ Continuous calculation function

The results of a calculation obtained using [EXE] can be used directly for subsequent calculation. Since the result of the initial calculation has been displayed, it is limited to a 10-digit mantissa (the limitation for displayed values) in subsequent calculations.

Ex. 3 × 4 = 12 12/3.14 =

3 [×] 4 [EXE]
(Continuing) [÷] 3.14
[EXE]

```
                    12.
12./3.14_
          3.821656051
```

Ex. 1 / 3 × 3 =

1 [÷] 3 [×] 3 [EXE]
1 [÷] 3 [EXE]
(Continuing) [×] 3
[EXE]

```
                     1.
          0.3333333333
0.3333333333×3_
          0.9999999999
```

Ex. 25 × 3 = 75 75^2 =

25 [×] 3 [EXE]
(Continuing) [x^2]
[EXE]

```
                    75.
75.²_
              5625.
```

* This function can also be used with the Type A functions (x^2, x^{-1}, $x!$) described on page 36.

■ Replay function

- This function stores formulas when they are executed. Pressing either the [◁] or [▷] key while the result of the formula is being displayed will display the executed formula again for confirmation or correction.
  Pressing [▷] displays the formula with the cursor located at the first character of the formula.
  Pressing [◁] displays the formula with the cursor located at the space following the last character of the formula.
  Once the formula is displayed, the cursor keys can be used to move the cursor to any location to change values or commands. Then, the formula can be executed again by pressing [EXE].

Ex.

123×456

EXE

(Continuing) ⇨

EXE

(Continuing) ⇦

123×456_
56088.
123×456
56088.
123×456_

Ex. 4.12×3.58+6.4=21.1496

4.12×3.58−7.1=7.6496

4.12×3.58+6.4EXE

⇦

⇦⇦⇦⇦

−7.1

EXE

21.1496
4.12×3.58+6.4_
4.12×3.58+6.4
4.12×3.58−7.1_
7.6496

- When an error is generated by execution of a calculation, pressing either ⇨ or ⇦ will cancel the error message and locate the cursor at the point in the formula where the error was generated. This eliminates the need of clearing the error with the AC key and then reinputting the formula.

Ex. When 14 / 0 × 2.3 is mistakenly executed for 14 / 10 × 2.3

14/0×2.3EXE

⇨ (or ⇦)

Ma ERROR
14/0×2.3

Error generated here.

⇦ SHIFT INS 1

EXE

14/10×2.3
3.22

* The replay function can store up to 79 characters (see page 19).
* The replay function is cleared by pressing AC or by turning the power of the unit OFF.
* The replay function can also be used after formula manipulation by pressing SHIFT ⇨ or SHIFT ⇦.

2-3 FUNCTIONAL CALCULATIONS

■ Trigonometric and inverse trigonometric functions

- Be sure to set the angular unit before performing trigonometric or inverse trigonometric function calculations.

Example	Operation	Display
$\sin 63.878^\circ = 0.8978585851$	MODE 4 → "D" sin 63.878 EXE	0.8978585851
$\cos(\frac{\pi}{3}\text{rad}) = 0.5$	MODE 5 → "R" cos (SHIFT π ÷ 3) EXE	0.5
$\tan(-35\text{gra}) = -0.6128007881$	MODE 6 → "G" tan (−) 35 EXE	−0.6128007881
$2 \cdot \sin 45^\circ \times \cos 65^\circ = 0.5976724775$	MODE 4 → "D" 2 × sin 45 × cos 65 EXE (× can be omitted.)	0.5976724775
$\sin^{-1} 0.5 = 30^\circ$	SHIFT sin 0.5 EXE (Can be entered as .5.)	30.
$\cos^{-1}\frac{\sqrt{2}}{2} = 0.7853981634\text{rad} = \frac{\pi}{4}\text{rad}$	MODE 5 → "R" SHIFT cos (√ 2 ÷ 2) EXE ÷ SHIFT π EXE	0.7853981634 0.25
$\tan^{-1} 0.741 = 36.53844577^\circ$	MODE 4 → "D" SHIFT tan 0.741 EXE	36.53844577
$2.5 \times (\sin^{-1} 0.8 - \cos^{-1} 0.9) = 68.22042398$	2.5 × (SHIFT sin 0.8 − SHIFT cos 0.9) EXE	68.22042398

■ Logarithmic and exponential functions

Example	Operation	Display
$\log 1.23 (\log_{10} 1.23) =$ $8.990511144 \times 10^{-2}$	log 1.23 EXE	8.990511144E-02
$\ln 90 (\log_e 90) =$ 4.49980967	SHIFT ln 90 EXE	4.49980967
$\log 456 \div \ln 456 =$ 0.4342944819 (log/ln ratio = constant M)	log 456 ÷ SHIFT ln 456 EXE	0.4342944819
$10^{1.23} = 16.98243652$ (Obtains antilogarithm of natural logarithm 1.23)	10^x 1.23 EXE	16.98243652
$e^{4.5} = 90.0171313$	SHIFT e^x 4.5 EXE	90.0171313
$10^4 \cdot e^{-4} + 1.2 \cdot 10^{2.3} =$ 422.5878667	10^x 4 × SHIFT e^x (−) 4 + 1.2 × 10^x 2.3 EXE	422.5878667
$5^3 + 6^4 + 7^5 = 18228$	5 x^2 3 + 6 x^2 4 + 7 x^2 5 EXE	18228.
* Only a 1-digit natural number can be used following x^2.		
$5.6^{2.3} = 52.58143837$	5.6 SHIFT x^y 2.3 EXE	52.58143837
$\sqrt[7]{123} (123^{\frac{1}{7}}) =$ 1.988647795	7 SHIFT $\sqrt{\ }$ 123	1.988647795
$(78-23)^{-12} =$ $1.305111829 \times 10^{-21}$	(78 − 23) SHIFT x^y (−) 12 EXE	1.305111829E-21
$\sqrt[4]{63} \times 2.5^{15} =$ 2623827.427	4 SHIFT $\sqrt[x]{\ }$ 63 × 2.5 SHIFT x^y 15 EXE	2623827.427
* The same result as above can be obtained by: 4 SHIFT $\sqrt[x]{\ }$ 63 × 2.5 x^2 1 x^2 5 EXE		
$2 + 3 \times \sqrt[3]{64} - 4 = 10$	2 + 3 × 3 SHIFT $\sqrt[x]{\ }$ 64 − 4 EXE	10.
* x^n, x^y, and $\sqrt[x]{\ }$ are given priority over multiplication and division.		
$2 \times 3.4^{(5+6.7)} =$ 3306232.001	2 × 3.4 SHIFT x^y (5 + 6.7) EXE	3306232.001

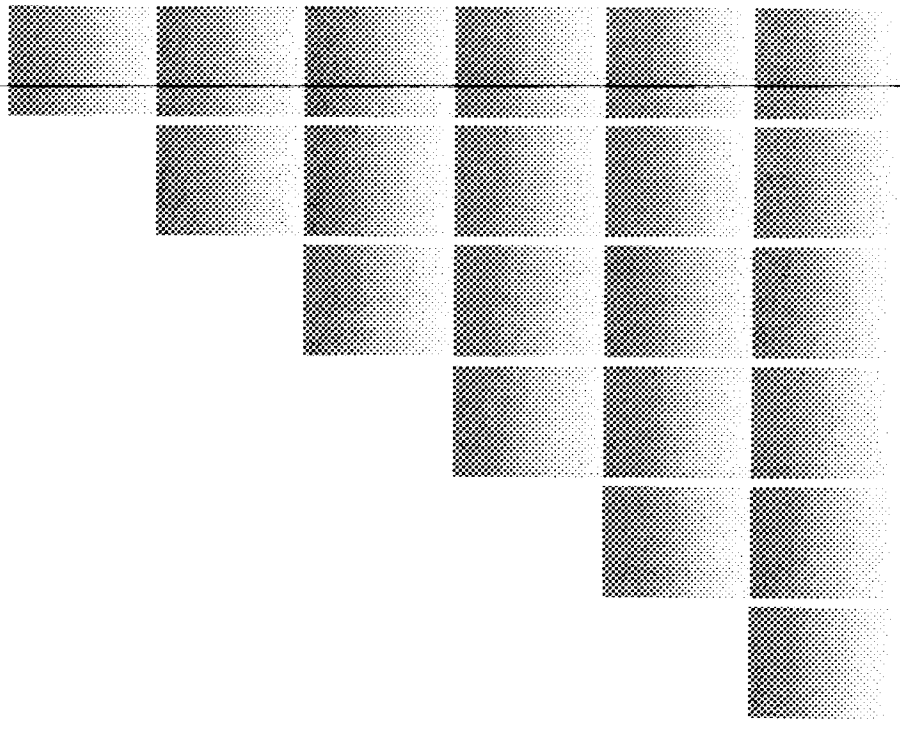
■ Other functions ($\sqrt{\ }$、x^2、x^{-1}、$x!$)

Example	Operation	Display
$\sqrt{2}+\sqrt{5}=3.65028154$	√ 2 + √ 5 EXE	3.65028154
$2^2+3^2+4^2+5^2=54$	2 x^2 + 3 x^2 + 4 x^2 + 5 x^2 EXE	54.
$\frac{1}{\frac{1}{3}-\frac{1}{4}}=12$	(3 x^{-1} − 4 x^{-1}) x^{-1} EXE	12.
$8!(=1\times2\times3\times\cdots\times8)=40320$	8 SHIFT $x!$ EXE	40320.
$\sqrt{13^2-5^2}+\sqrt{3^2+4^2}=17$	√ (13 x^2 − 5 x^2) + √ (3 x^2 + 4 x^2) EXE	17.
$\sqrt{1-\sin^2 40^\circ}=0.7660444431=\cos 40^\circ$	MODE 4 √ (1 − (sin 40) x^2) EXE	0.7660444431
(Proof of $\cos\theta=\sqrt{1-\sin^2\theta}$)	(Continuing) SHIFT DRG▶ Ang EXE	40.
$\frac{1}{2!}+\frac{1}{4!}+\frac{1}{6!}+\frac{1}{8!}=0.5430803571$	2 SHIFT $x!$ x^{-1} + 4 SHIFT $x!$ x^{-1} + 6 SHIFT $x!$ x^{-1} + 8 SHIFT $x!$ x^{-1} EXE	0.5430803571

■ Hyperbolic and inverse hyperbolic functions

Example	Operation	Display
$\sinh 3.6 = 18.28545536$	hyp sin 3.6 EXE	18.28545536
$\cosh 1.23 = 1.856761057$	hyp cos 1.23 EXE	1.856761057
$\tanh 2.5 = 0.9866142981$	hyp tan 2.5 EXE	0.9866142981
$\cosh 1.5 - \sinh 1.5 = 0.2231301602 = e^{-1.5}$ (Proof of $\cosh x \pm \sinh x = e^{\pm x}$)	hyp cos 1.5 − hyp sin 1.5 EXE (Continuing) SHIFT ln Ans EXE	0.2231301602 −1.5
$\sinh^{-1} 30 = 4.094622224$	SHIFT hyp sin 30 EXE	4.094622224
$\cosh^{-1}\left(\frac{20}{15}\right) = 0.7953654612$	SHIFT hyp cos (20 ÷ 15) EXE	0.7953654612
Determine the value of x when $\tanh 4x = 0.88$ $x = \frac{\tanh^{-1} 0.88}{4} = 0.3439419141$	SHIFT hyp tan 0.88 ÷ 4 EXE	0.3439419141
$\sinh^{-1} 2 \times \cosh^{-1} 1.5 = 1.389388923$	SHIFT hyp sin 2 × SHIFT hyp cos 1.5 EXE	1.389388923
$\sinh^{-1}\left(\frac{2}{3}\right) + \tanh^{-1}\left(\frac{4}{5}\right) = 1.723757406$	SHIFT hyp sin (2 ÷ 3) + SHIFT hyp tan (4 ÷ 5) EXE	1.723757406

FORMULA MANIPULATION 3



3-1 WHAT IS FORMULA MANIPULATION?

The formula manipulation function of this unit allows analysis through simplification, expansion, factoring and solution of formulas made up of numeric values and operators.

■ Formula manipulation calculation

This unit is capable of the following formula manipulation calculation functions:

①Simplification (page 41)
②Expansion (page 43)
③Factoring (page 44)
④Equation solution (page 45)
⑤Solution set determination (page 45)

■ Formula manipulation operators

The following operators are used in formula manipulation calculations:

+、 −、 ×、 /

x^n、 x^y、 $\sqrt{x}$

■ Kinds of formulas

The following two types of formulas can be processed using formula manipulation:

Monomials....Product of numbers or characters (i. e. $2a^2$, $3ab$)
Polynomials..Sum of monomials (i. e. $x^2-2x+5+3(x-4)^2$)

■ Display sequence

Manipulated formulas are displayed in the following sequence:

(1) Monomials

- ①Negative symbols, ②Coefficients, ③Variables, ④Type A functions, ⑤polynomials in parentheses, ⑥Type B functions
  Ex. $-2ab^2(a+b)\sin a$
- Powers are displayed according to the alphabetic order of the variable name.
  Ex. $2ab^2c$、 $b(a+b)^3$
- Type A functions are displayed after variables and before parentheses.
  Ex. $3ab\,!\,(a+b)$、 $(a+b)\,!\,(a+b)$

- Parenthetical expressions are displayed according to their contents. When variable name sequences are identical, they are displayed from the expression containing the highest exponential value first.
  Ex. $(a+b)(b+c)$、 $(a^2+b)(a+b)$
- In a multiplication operation that contains a type A function with a numeric value, the type A function is displayed as the multiplier.
  Ex. $a \times 3!$
- Two parenthetical expressions which are identical except that one expression is longer are displayed with the shorter expression first.
  Ex. $(a+b)(a+b-c)$

(2) Polynomials

- Variables are displayed in alphabetical order, with the highest exponential value first.
  Ex. a^2+a-3、 $a^2+ab^2-a+\sin a$
- Polynomials are displayed in the order dictated by the monomials from which they are composed.
  Ex. $(a+b)(ab+a)$、 $(a+b^2)(a+b)$、 $(a+b)(a+\sin b)$

《IMPORTANT》

Pressing [EXE] while a formula is still displayed after formula manipulation or after being recalled by pressing [RCL] will execute the displayed formula if values exist (in value memory) for all variables used. Pressing [EXE] while the result of a manually input formula is displayed will re-execute the formula (since it is stored by the Replay function), causing no change in the display of the result. After manipulation and execution of formulas, however, the original (before manipulation) formula is still retained by the Replay function, and may generate an error if re-executed.

Ex.

5 [STO] [A]

[ALPHA] [X] [+] [ALPHA] [A] [−] [ALPHA] [X] [SMPL]

[EXE] (Execution of displayed formula)

[EXE] (Execution of formula stored by the replay function: $x + a - x$)

⇨ (Error occurred because no value exists for variable x.)

5.
A
5.
Syn ERROR
X+A−X

3-2 FORMULA SIMPLIFICATION

- Displayed formulas can be simplified by pressing the SMPL key.
- The simplified formula is shown on the display reading from left to right. For especially long formulas, only the first 24 characters will be displayed (due to the size of the display), and the "→" symbol will appear to indicate that the formula continues to the right. The entire formula can be viewed by moving the cursor using the ▷ and ◁ keys.
- There are no limitations on the exponents used in formulas.
- The letters A through L and X, Y, Z can be used as algebraic symbols, but X, Y, and Z cannot be used during execution of the formula since they do not represent value memories. Attempting to use one of these three symbols during formula execution will result in a Syn ERROR.
- Formulas that include functions can also be simplified.
- The replay function (input formula display) can be used after simplification by pressing SHIFT ▷ or SHIFT ◁.
- Decimals cannot be used in coefficients or in constant terms. Simplification cannot be performed when decimals are present.

Ex. To simplify $15a \times 3$:

15 ALPHA (-) × 3
SMPL

```
15A×3_
45A
```

Ex. To simplify $5x^2+7x-6-3x^2+2x+9$:

5 ALPHA (-) x^2 + 7 ALPHA (-) − 6 −
3 ALPHA (-) x^2 + 2 ALPHA (-) + 9
SMPL

```
5X²+7X-6-3X²+2X+9_
2X²+9X+3
```

Ex. To simplify $(-2a)^2\times(-3b)$ and then solve when $a=2$ and $b=3$:

2 STO A	2.
3 STO B	3.
◀ ▶ 2 ALPHA A) x^2 ×	
◀ ▶ 3 ALPHA B)	(-2A)²×(-3B)_
SMPL	-12A²B
EXE (Store values in value memories)	-144.

Ex. To simplify $2x^2+3-5x^2+4$ and then $2x^2+3-6x^2-5x+3$ using the replay function:

2 ALPHA X x^2 + 3 − 5 ALPHA X	
x^2 + 4	2X²+3-5X²+4_
SMPL	-3X²+7
SHIFT ◀ (Replay function)	2X²+3-5X²+4_
◀ ◀ ◀ ◀ ◀	2X²+3-5X²+4
6 ▶ ▶	2X²+3-6X²+4
− 5 ALPHA X + 3	2X²+3-6X²-5X+3_
SMPL	-4X²-5X+6

3-4 FACTORING

- Displayed formulas can be factored by pressing the [FCTR] key.
- The factored formula is shown on the display reading from left to right. For especially long formulas, only the first 24 characters will be displayed (due to the size of the display), and the "→" symbol will appear to indicate that the formula continues to the right. The entire formula can be viewed by moving the cursor using the [▷] and [◁] keys.
- Equations up to the third degree can be factored. (i.e. $3a^3+2a^2-a+4$)
- The replay function (input formula display) can be used after factoring cannot be performed when other letters are used for algebraic symbols.
- Formulas that include functions cannot be expanded.
- The replay function (input formula display) can be used after factoring by pressing [SHIFT] [▷] or [SHIFT] [◁].
- Only integers can be used in coefficients and constant terms. Decimals and exponents cannot be used.
- Formulas that include fractional expressions cannot be factored.

Ex. To factor $2a^2-6a$:

Keys	Display
2 [ALPHA] [A] [x^2] − 6 [ALPHA] [A]	2A²-6A_
[FCTR]	2A(A-3)

Ex. To factor $(a-b)c+(a-b)b$:

Keys	Display
([ALPHA] [A] − [ALPHA] [B]) [ALPHA] [C] +	(A-B)C+(A-B)B_
([ALPHA] [A] − [ALPHA] [B]) [ALPHA] [B]	
[FCTR]	(A-B)(B+C)

Ex. To factor $8a^3-1$ and the solve when $a=7$:

Keys	Display
7 [STO] [A] (Store values in value memories)	7.
8 [ALPHA] [A] [x^3] 3 − 1	8A³-1_
[FCTR]	(4A²+2A+1)(2A-1)
[EXE] (Formula execution)	2743.

- The two solutions of a quadratic equation are displayed simultaneously separated by a comma.
- Multiple solution sets are also displayed simultaneously separated by commas.
- The solutions of three-unknown simultaneous equations are displayed in the order of x, y, z, separated by commas. The solutions of two-unknown equations are displayed in the order of x, y.

Ex. To solve $3x - 6 = 0$:
This equation fits the pattern of $Ax + B = 0$, so 3 is stored in memory A, and -6 in memory B.

3 STO A (-) 6 STO B

SHIFT (x) (Equation display)

EXE (Solution set display)

-6.
3X-6=0
2

Ex. To solve $-12x^2 + 32x + 12 = 0$:
This equation fits the pattern of $Ax^2 + Bx + C = 0$, so -12 is stored in memory A, 32 in memory B, and 12 in memory C.

(-) 12 STO A 32 STO B 12 STO C

SHIFT (x²) (Equation)

EXE (Formula solution set)

→ → (Displays remainder of formula)

EXE (Numeric solution set)

12.
-12X²+32X+12=0
-√1600/24+4/3,√1600/24+4
1600/24+4/3,√1600/24+4/3
-0.3333333333,3

Ex. To solve $2x + 3y = 8$; $x + y = 3$:

2 STO A 3 STO B 8 STO D

1 STO E STO F 3 STO H

SHIFT (xy) (Equation)

EXE (Numeric solution set)

8.
3.
2X+3Y=8,X+Y=3
1,2

APPENDICES

■ Function input range (general)

Function name	Input range
$\sin x$、$\cos x$、$\tan x$	$\|x\| < 1440°$ (8π rad、1600gra)
$\sin^{-1}x$、$\cos^{-1}x$	$\|x\| \leqq 1$
$\tan^{-1}x$	$\|x\| < 10^{100}$
e^x	$-10^{100} < x \leqq 230.2585092$
$\sinh x$、$\cosh x$	$-10^{100} < x \leqq 230.2585092$
$\tanh x$	$\|x\| < 10^{100}$
$\sinh^{-1}x$	$\|x\| < 5 \times 10^{99}$
$\cosh^{-1}x$	$1 \leqq x < 5 \times 10^{99}$
$\tanh^{-1}x$	$\|x\| < 1$
$\log x$、$\ln x$	$10^{-100} < x < 10^{100}$
10^x	$-10^{100} < x < 100$
$\sqrt{x}$	$0 \leqq x < 10^{100}$
x^2	$\|x\| < 10^{50}$
$x^{-1}\left(\frac{1}{x}\right)$	$\|x\| < 10^{100}$、$x \neq 0$
$x!$	$0 \leqq x \leqq 69$ (x = integer)
x^y	y = natural number when $x < 0$
x^n	$n = 0 \sim 9$ (n = integer)
$\sqrt[x]{y}$	$y \geqq 0$、$x \neq 0$

* Result precision is generally ±1 at the 10th place.
* Since errors may be cumulative for internal calulations using such functions as x^y, $x!$ and $\sqrt[x]{y}$, accuracy is sometimes affected.
* In $\tan x$, $|x| \neq 90° \times (2n + 1)$, $|x| \neq \frac{\pi}{2}$ rad $\times (2n + 1)$, $|x| \neq 100$grad $(2n + 1$: (n = integer.)
* Errors are cumulative and acuracy is affected when $x = 0$ for $\sinh x$ and $\tanh x$.

MEMO